EAZA RMG
EAZA Reproductive Management Group

Primates: *Callitrichidae*

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We would recommend assessing any contraceptive bout with behavioural and hormone monitoring. For more information on this, please contact contraception@chesterzoo.org

Contraceptive methods:	**GnRH agonist (implant)**	**GnRH agonist (injection)**	**Progestagen (implants)**	**Progestagen (implant)**	**Progestagen (injection)**	**Progestagen (injection)**	**Surgical/ Permanent**
Contraceptive Product:	Deslorelin acetate	Leuprolide acetate	Etonogestrel 68 mg	Levonorgestrel 2x 75mg	Medroxyprogesterone acetate	proligestrone 100mg/ml	**N/A**
Commercial Name:	Suprelorin ®	Lupron ®	Implanon® Nexplanon®	Jadelle®	Depo-Provera®, Depo-Progevera®	Delvosteron®	Vasectomy
Product Availability	4.7mg ('Suprelorin 6') and 9.4 mg ('Suprelorin 12') widely available through veterinary drug distributors in the EU.	Leuprolide acetate licenced for human use	Manufactured by Organon. Available through human drug distributors	Manufactured by Bayer Schering Pharma AG. Available through human drug distributors	Manufactured by Pfizer. Widely available throughout Europe through human drug distributors.	Manufactured by MSD animal Health UK, Intervet Europe. Licensed for use in female dogs, cats, and ferrets; available through veterinary distributors.	**N/A**
Restrictions and/or permit required by Importing Country:	The EAZA RMG recommends: always check with your local licencing authority	Data deficient	The EAZA RMG recommends: always check with your local licencing authority	The EAZA RMG recommends: always check with your local licencing authority	The EAZA RMG recommends: always check with your local licencing authority	The EAZA RMG recommends: always check with your local licencing authority	**N/A**
Mechanism of action:	GnRH agonist suppress the reproductive endocrine system, preventing production of pituitary and gonadal hormones. As an agonist of the GnRH initially stimulates the reproductive system -which can result in oestrus and ovulation in females or temporary enhancement of testosterone and spermatogenesis in males- therefore additional contraception needed during this time. Please see below and refer to Deslorelin datasheet for detailed information	GnRH agonist suppress the reproductive endocrine system, preventing production of pituitary and gonadal hormones	Interference with fertilization by thickening cervical mucus, interrupting gamete transport, disruption of implantation, inhibition of LH surge necessary for ovulation	Interference with fertilization by thickening cervical mucus, interrupting gamete transport, disruption of implantation, inhibition of LH surge necessary for ovulation	Anti-estrogenic activity. Interference with fertilization by thickening cervical mucus, interrupting gamete transport, disruption of implantation, inhibition of LH surge necessary for ovulation	Anti-estrogenic activity. Interference with fertilization by thickening cervical mucus, interrupting gamete transport, disruption of implantation, inhibition of LH surge necessary for ovulation	Surgical procedure in which the ductus deferens are cut, tied, cauterized, or otherwise interrupted
Insertion/Placement:	Subcutaneous, in a place where it can be easily detected or seen for removal at a later date (I.e. Upper inner arm); refer Suprelorin fact sheet for effective method of implant placement (tunnelisation)	Injectable	Subcutaneous. The EAZA RMG recommends sub-cutaneous, upper inner arm for visibility (aid for later removal)	Subcutaneous. The EAZA RMG recommends sub-cutaneous, upper inner arm for visibility (aid for later removal)	Injectable intramuscular	Injectable subcutaneously - do not inject intradermally or into subcutaneous fat or scar tissue	Surgical
Females		**Data deficient**					
Dose	1 x 4.7 mg or 1 x 9.4 mg implant is recommended in callitrichids **DO NOT CUT IMPLANT**	Dosing information is not available; extrapolation from human literature is likely the best place to start	Recommended 1/3 to 1/4 implant, depending on species and weight; but never less than 1/4.	Recommended 1/2 rod, depending on species and weight. Doses not well established	MPA can have a variable length of duration and, like in the other progestagens, a much higher dose is needed than in Afro-Eurasian primates for efficacy: 20mg/kg body weight of Depo-Provera is effective for approximately 30 days. For these reasons MPA is only advisable as a short term contraceptive to suppress post-partum oestrus	A dose of 50 mg/kg of Delvosteron has been used in a collection for short term contraception being effective for approximately 3 months. This drug is only advisable as a short term contraceptive e.g. to suppress post-partum oestrus, introduction of newly vasectomised male. Repeated use not advised.	**N/A**
Latency to effectiveness:	3 weeks average - additional contraception needed during this time **(PLEASE see product data sheet) to suppress the stimulation phase**. In callitrichids 5mg megestrol acetate pills (Megace) have been used daily 7 days before and 7 days after implant has been placed	Same as deslorelin with an initial stimulation phase and suppression should then occur 3-4 weeks later (please refer to deslorelin and lupron datasheet for more details)	In general inhibition of ovulation after 1 day when inserted on day 1-5 of cycle or when replacing oral progestogen. As the right stage during oestrus cycle is often unknown, it is advised to separate the sexes for at least 7-14 days after insertion of the implant.	In general inhibition of ovulation after 1 day when inserted on day 1-5 of cycle or when replacing oral progestogen. As the right stage during the oestrus cycle is often unknown, it is advised to separate the sexes for at least 7-14 days after insertion of the implant.	1-3 days post injection. However, if the cycle stage is not known then extra time must be allowed; therefore, separation of the sexes should be used for at least 1 week. Depo-Provera injection can be used to prevent the post-partum oestrus until a suitable longer term implant can be placed or as longer term contraception.	1-3 days post injection. However, if the cycle stage is not known then extra time must be allowed; therefore, separation of the sexes should be used for at least 1 week. Delvosteron injection can be used to prevent the post-partum oestrus until a suitable longer term implant can be placed or as longer term contraception.	**N/A**
Oestrus cycles during contraceptive treatment:	Initial oestrus and ovulation (during the 3 weeks of stimulation) then no oestrus cycle. To supress the initial oestrus and ovulation you can follow the megestrol acetate protocol mentioned above.	Same as deslorelin.	Oestrus is inhibited.	Oestrus is inhibited.	Oestrus behaviour may be observed.	Oestrus behaviour may be observed. Ovulation and cycling can occur in adequately contracepted individuals (but is unlikely and the degree of suppression is dose dependent).	**N/A**
Use during pregnancy:	**Not recommended**	**Not recommended**	In non-human interference with parturition has not been observed.	In non-human primates progestagens normally do not interfere with parturition.	In non-human primates progestagens normally do not interfere with parturition.	In non-human primates progestagens normally do not interfere with parturition.	**N/A**
Use during lactation:	No contraindications once lactation established	No contraindications once lactation established	Considered safe for nursing; Does not affect lactation, but etonogestrel is excreted in milk.	Considered safe for nursing infant.	Considered safe for nursing infant.	Considered safe for nursing infant.	**N/A**
Use in prepubertals or juveniles:	**Data deficient** in this group, see product information sheet. Possible long-term effects on fertility are not known therefore use in prepubertal individuals should be carefully evaluated.	**Data deficient** in this group, see product information sheet	The use of synthetic progestagens in prepubertals or juveniles has not been fully assessed. Possible long-term effects on fertility are not known therefore use in prepubertal individuals should be carefully evaluated.	The use of synthetic progestagens in prepubertals or juveniles has not been fully assessed. Possible long-term effects on fertility are not known therefore use in prepubertal individuals should be carefully evaluated.	The use of synthetic progestagens in prepubertals or juveniles has not been fully assessed. Possible long-term effects on fertility are not known therefore use in prepubertal individuals should be carefully evaluated.	The use of synthetic progestagens in prepubertals or juveniles has not been fully assessed. Possible long-term effects on fertility are not known therefore use in prepubertal individuals should be carefully evaluated.	**N/A**
Duration	Duration of efficacy has not been well established as a guide: 4.7 mg implants will suppress for a **minimum** of 6 months; 9.4mg will be effective for a **minimum** of 12months. In general, duration of effect is longer than the minimum stated.	Not well established, duration of effect being likely related to the dose. Higher doses result in longer duration of effect. This is extremely **data deficient**	2-3 years in various primates	2-3 years in various primates	Dose dependant: 30 days in general. However, effects could last 1-2 years in some individuals.		**N/A**

Reversibility	Considered reversible but every species has not been tested, duration to reversibility extremely variable with some females giving birth to offspring between 6 months to 5 years after estimated implant expiry. we have a reversal rate of 41%. Implants were removed in 50% of cases. Removal of implant to aid reversibility is recommended.	Considered reversible but every species has not been tested. duration to reversibility extremely variable.	Designed to be fully reversible but individual variation can occur. To increase potential for full reversibility implants must be removed. A recent study has demonstrated that if implants are removed, 83% of marmosets reversed within 5-12.5 months[8]. We have various records of reversal in callitrichids, with time to birth ranging between 5-7 months after the estimated implant expiry. In most cases it is unknown whether implants were removed.	Designed to be fully reversible but individual variation can occur. To increase potential for full reversibility implants must be removed.	Designed to be fully reversible but individual variation can occur. Our records demonstrate a 95% reversal rate in females allowed to breed following Depo-Provera with many conceiving immediately following the estimated contraception expiry date.	Designed to be fully reversible but individual variation can occur	**N/A**
Effects on Behaviour	None observed except lack of libido. There are anecdotal reports of change of hierarchy with the behavioural implications that this may have	Same as deslorelin	Effects on behaviour have not been studied, every individual may react differently. Because progestagens can suppress ovulation it can be expected that courtship and mating behaviour will be affected in some way. Further research in the subject is necessary.	Effects on behaviour have not been studied, every individual may react differently. Because progestagens can suppress ovulation it can be expected that courtship and mating behaviour will be affected in some way. At high doses can have masculinising effect. Further research in the subject is necessary.	Effects on behaviour have not been studied, every individual may react differently as it binds readily to androgen receptors and is antiestrogenic, females may experience male-like qualities (increased aggression , development of male secondary sex characteristics, etc.) Further research in the subject is necessary.		**N/A**
Effects on sexual physical characteristics	Similar to gonadectomy		Some signs of oestrus behaviour might occur. Ovulation may also occur even though pregnancy does not ensue.	Some signs of oestrus behaviour might occur. Ovulation may also occur even though pregnancy does not ensue.	See above	See above	**N/A**
Males	**Data deficient**	**Data deficient see comment for deslorelin**	**Not Recommended**	**Not Recommended**	**Not Recommended**	**Not Recommended**	Reported
Dose	1 x 4.7 mg or 1 x 9.4 mg implant is recommended in callitrichids	Usually a higher dose than in females are required in males. **Data deficient**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Latency to effectiveness:	Depending on the species there may be fertile sperm present in vas deferens for 6-8 weeks post treatment or even longer. Testosterone decreases after 3-4 weeks but sperm can stay fertile for many weeks after. Libido will decrease with decreasing testosterone concentrations therefore the risk of pregnancy decreases. Additional contraception in females is needed during this time or you should separate the sexes	Depending on the species there may be fertile sperm present in vas deferens for 6-8 weeks post treatment or even longer. Testosterone decreases after 3-4 weeks but sperm can stay fertile for many weeks after. Libido will decrease with decreasing testosterone concentrations therefore the risk of pregnancy decreases. Additional contraception in females is needed during this time or you should separate the sexes	**N/A**	**N/A**	**N/A**	**N/A**	Depending on species and individual, perhaps as long as 2 months or more
Use in prepubertals or juveniles:	**Data deficient** in this group, see product information sheet	**Data deficient** in this group, see product information sheet	**N/A**	**N/A**	**N/A**	**N/A**	**Data deficient**
Duration and Reversibility	Reversibility has been demonstrated in *Callithrix* and *Callimico* sp. within 1 year of implant expiry.	No data yet but deslorelin is considered reversible. **Data deficient** in this group, see product information sheet.	**N/A**	**N/A**	**N/A**	**N/A**	The procedure should not be used in males likely to be recommended for subsequent breeding as reversal is unlikely
Effects on Behaviour	Testosterone related aggression is likely to decrease. **Data deficient** in this group, see product information sheet.	Testosterone related aggression is likely to decrease. **Data deficient** in this group, see product information sheet.	**N/A**	**N/A**	**N/A**	**N/A**	Vasectomy will not affect androgen-dependant behaviours
Effects on sexual physical characteristics	Decrease in body size, feminisation of males.	Decrease in body size, feminisation of males.	**N/A**	**N/A**	**N/A**	**N/A**	None observed in non-human primates
General:							
Side effects	Similar to gonadectomy; especially weight gain	Similar to gonadectomy; especially weight gain	Possible weight gain. The EAZA RMG recommends always reading the manufacturer's data sheet	Possible weight gain. At high doses can have masculinising effect. The EAZA RMG recommends always reading the manufacturer's data sheet	Long term use is not recommended since it can have possible deleterious effects on the uterus and mammary tissue. We have anecdotal evidence of one female who developed endometrial hyperplasia after a single injection. Progestins are likely to cause weight gain in all species. In the human literature, Depo-Provera® has been linked to mood changes. Because it binds readily to androgen receptors and is anti-estrogenic, females may experience male-like qualities (increased aggression, development of male secondary sex characteristics, etc.). The EAZA RMG recommends always reading the manufacturer's data sheet	Possible weight gain. The EAZA RMG recommends always reading the manufacturer's data sheet	**N/A**
Warnings	Causes initial gonadal stimulation; correct administration essential - see product information sheet	Causes initial gonadal stimulation	Interaction with other drugs are known to occur and may influence protection against pregnancy. In some diabetic animals progestagens has led to an increased insulin requirement. For this reason, progestagens are contraindicated in diabets or not recommended. The EAZA RMG recommends always reading the manufacturer's data sheet.	Interaction with other drugs are known to occur and may influence protection against pregnancy. In some diabetic animals progestagens has led to an increased insulin requirement. For this reason, progestagens are contraindicated in diabets or not recommended. The EAZA RMG recommends always reading the manufacturer's data sheet.	We have anecdotal evidence of one female who developed endometrial hyperplasia after a single injection. Interaction with other drugs are known to occur and may influence protection against pregnancy. In some diabetic animals progestagens has led to an increased insulin requirement. For this reason, progestagens are contraindicated in diabets or not recommended. The EAZA RMG recommends always reading the manufacturer's data sheet.	Interaction with other drugs are known to occur and may influence protection against pregnancy. The EAZA RMG recommends always reading the manufacturer's data sheet.	Infection of the surgical wound might occur. Intradermal closure of the skin is advised together with prophylactic antibiotic treatment and NSAID
Reporting Requirements: In order to increase our knowledge of the efficacy of contraception methods in the Callitrichidae family it is recommended that all individuals on contraception be reported to the EAZA RMG							

References:
1) Callitrichid Husbandry Guidelines
2) Noah Compendium of data sheets - Delvosteron - http://www.noahcompendium.co.uk
3) Asa, C.S. & Porton, I.J. (eds.) (2005) Wildlife Contraception: Issues, Methods, and Applications. The Johns Hopkins University press: Baltimore.
4) Murnane, R. D., Zdziarski, J. M., Walsh, T. F., Kinsel, M. J., Meehan, T. P., Kovarik, P., ... & Phillips Jr, L. G. (1996). Melengestrol acetate-induced exuberant endometrial decidualization in Goeldi's marmosets (*Callimico goeldii*) and squirrel monkeys (*Saimiri sciureus*). *Journal of Zoo and Wildlife Medicine* , 315-324.

5) Wood, C., Ballou, J. D., & Houle, C. S. (2001). Restoration of reproductive potential following expiration or removal of melengestrol acetate contraceptive implants in golden lion tamarins (*Leontopithecus rosalia*). *Journal of Zoo and Wildlife Medicine* , 32(4), 417-425.
6) Mustoe, A. C., Jensen, H. A., & French, J. A. (2012). Describing ovarian cycles, pregnancy characteristics, and the use of contraception in female white-faced marmosets, *Callithrix geoffroyi. American Journal of Primatology* , 74(11), 1044-1053.
7) Wheaton, C. J., Savage, A., Shukla, A., Neiffer, D., Qu, W., Sun, Y., & Lasley, B. L. (2011). The use of long acting subcutaneous levonorgestrel (LNG) gel depot as an effective contraceptive option for cotton-top tamarins (*Saguinus oedipus*). *Zoo Biology* , 30(5), 498-522.
8) Roubos, S., Louwerse, A. L., Langermans, J. A., & Bakker, J. (2021). Retrospective Analysis of the Effectiveness and Reversibility of Long-Acting Contraception Etonogestrel (Implanon®) in Common Marmosets (*Callithrix jacchus). Animals* , 11(4), 963.